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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/726,118	12/02/2003	Seung-Hoon Nam	678-1220 (P11028)	4785

28249 7590 01/25/2007  
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EXAMINER
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TU, JULIA P

ART UNIT	PAPER NUMBER
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2611

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/25/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/726,118

Applicant(s)

NAM ET AL.

Examiner

Julia P. Tu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on December 2, 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1-5, 10-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claims 1 and 10 recite the limitation "the received training symbol groups" in line 8 of claim 1 and in line 7 of claim 10. There is insufficient antecedent basis for this limitation in the claims.

Claims 2-5 and 11-14 are rejected as incorporating the deficiencies of claims 1 and 10 upon which they depend.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claim 1-5 are rejected under 35 U.S.C. 102(a) as being anticipated by Applicant Admitted Prior Art (AAPA).

(1) with regard to claim 1:

AAPA disclose a method for grouping a plurality of training symbols into a plurality of training symbol groups to perform channel estimation corresponding to at least two transmission antennas, loading individual training symbols contained in the training symbol groups on sub-carriers, and transmitting the training symbols loaded on the sub-carriers in an OFDM (Orthogonal Frequency Division Multiplexing) system for transmitting data using the at least two transmission antennas (pages 2, 3, paragraphs [0019-0023]), comprising the steps of:

creating the plurality of training symbol groups (page 3, paragraph [0022]); and transmitting training symbol groups only once using one transmission antenna from among the at least two transmission antennas at predetermined time intervals (page 3, the last 6 lines of paragraph [0022], paragraph [0025]).

(2) with regard to claim 2:

AAPA further disclose the plurality of training symbol groups are simultaneously transmitted in a non-overlapping pattern by a number of transmission antennas equal to a number of the training symbol groups (see table 2, 4 training symbol groups and 4 training transmission antennas).

(3) with regard to claim 3:

AAPA further teach wherein the plurality of training symbol groups are sequentially allocated to the at least two transmission antennas (see figure 2).

(4) with regard to claim 4:

AAPA further teach the method as set forth in claim 1, wherein the training symbols are grouped into the training symbol groups by:

$$x_i^p = c_i \quad i = (m-1)N_t + p$$

$$x_i^p = 0 \quad \text{otherwise}$$

$$0 \leq p \leq N_t - 1, \quad 1 \leq i \leq N_c N_t$$

where  $x_i^p$  is a training symbol included in the  $p^{\text{th}}$  training symbol group,  $N_t$  is the number of antennas or the number of training symbol groups,  $c_i$  is an arbitrary complex of a magnitude  $\sqrt{N_t}$ ,  $m$  is an integer lower than  $N_c$ , and  $N_c$  is number of training symbols allocated to one transmission antenna (see page 3, equation 4, paragraphs [0020-0021]).

(5) with regard to claim 5:

AAPA further teach each of the at least two transmission antennas transmits a training symbol allocated only once when transmitting a specific sub-carrier a predetermined number of times equal to a number of the at least two transmission antennas (page 2, paragraph [0015]).

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claims 10- 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art in view of Cimini, Jr. et al. (US 6,404,783).

(1) with regard to claim 10:

AAPA disclose an apparatus for grouping a plurality of training symbols into a plurality of training symbol groups to perform channel estimation corresponding to at least two transmission antennas, loading individual training symbols contained in the training symbol groups on sub-carriers, and transmitting the training symbols loaded on the sub-carriers in an OFDM (Orthogonal Frequency Division Multiplexing) system for transmitting data using the at least two transmission antennas (pages 2, 3, paragraphs [0019-0023]) , comprising:

the at least two transmission antennas for transmitting the training symbol groups received from a distributor.

AAPA disclose all of the above subject matters except for a distributor for distributing training group.

However, Cimini, Jr. discloses a distributor for distributing training group (block 306 in figure 3).

It is obvious to one of ordinary skill in the art at the time the invention was made to include a distributor for distributing training group as taught by Cimini, Jr. into the system as taught by AAPA in order to provide reliable, high-speed wireless access to mobile users (column 1, lines 18-19).

(2) with regard to claim 11:

AAPA further disclose the plurality of training symbol groups distributed from the distributor are simultaneously transmitted to be non-overlapping with each other by the at least two transmission antennas whose number is equal to a number of the training symbol groups (see page 3, table 2, 4 training groups and 4 transmission antennas).

(3) with regard to claim 12:

AAPA further disclose the distributor sequentially allocates the plurality of training symbols to the at least two transmission antennas to create the training symbol groups, and receives the training symbol groups (see figure 2).

(4) with regard to claim 13:

AAPA further teach the training symbols are grouped into the training symbol groups by:

$$x_i^p = c_i \quad i = (m-1)N_t + p$$

$$x_i^p = 0 \quad \text{otherwise}$$

$$0 \leq p \leq N_t - 1, \quad 1 \leq i \leq N_c N_t$$

where  $x_i^p$  is a training symbol included in the  $p^{\text{th}}$  training symbol group,  $N_t$  is the number of antennas or the number of training symbol groups,  $c_i$  is an arbitrary complex of a magnitude  $\sqrt{N_t}$ ,  $m$  is an integer lower than  $N_c$ , and  $N_c$  is number of

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training symbols allocated to one transmission antenna (see page 3, equation 4, paragraphs [0020-0021]).

(5) with regard to claim 14:

AAPA further disclose each of the transmission antennas transmits a training symbol allocated only once when transmitting a specific sub-carrier a predetermined number of times equal to the number of the transmission antennas (page 2, paragraph [0015]).

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 6, 8, 9, 15, 17,18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abeta et al. (US 2001/0028637) in view of Matsuoka et al. (US 2004/0008614).

(1) with regard to claim 6:

As shown in figure 22, Abeta discloses a method for performing channel estimation using received sub-carriers, comprising the steps of:



setting a first weight associated with a reliability of the first sub-carrier and a second weight associated with a reliability of the second sub-carrier, the first weight being different from the second weight (see figure 22, page 9, paragraphs [0129-0130]);

measuring channel estimation errors associated with individual received sub-carriers (blocks 122(1)-122(n) in figure 22; note that channel estimation error is calculated using mean square error, page 9, paragraph [0140]); and

performing channel estimation using the measured channel estimation errors and the set weights (blocks 124(1)-124(n) in figure 22; page 9, paragraph [0129]).

Abeta does not explicitly teach a system for receiving a first sub-carrier having a training symbol and a second sub-carrier having no training symbol. However an OFDM system for receiving a sub-carrier having a training symbol and another sub-carrier having no training symbol is well known in the art as it is evident by Matsuoka et al. (see page 2, paragraph [0017]; note: training symbol is known as preamble sequence, and no training symbol is known as data signal). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Matsuoka to the teaching of Abeta to provide a considerable simplification of the weight determining procedure as well as mitigating the effects of co-channel interference (page 3, paragraph [0022]).

(2) with regard to claim 8:

Matsuoka et al. further teach the channel estimation errors associated with individual sub-carriers that are transmitted from at least two transmission antennas are

measured when the sub-carriers are received from the at least two transmission antennas (see figure 8, multiple antennas).

(3) with regard to claim 9:

Abeta further discloses the channel estimation errors are measured irrespective of influences of noise occurring individual channels for transmitting the sub-carriers (page 8, paragraph [0130]; note that Abeta does not take into account noise in channel estimation process).

(4) with regard to claim 15:

As shown in figure 22, Abeta discloses an apparatus for performing channel estimation using received sub-carriers, comprising the steps of:

at least one reception antenna for receiving the sub-carriers, and transmitting the received sub-carriers (see base station in figure 15, base station receives and transmits sub-carriers); and

a channel estimator for setting a first weight associated with a reliability of the first sub-carrier and a second weight associated with a reliability of the second sub-carrier, measuring channel estimation errors associated with individual received sub-carriers (see figure 22, page 9, paragraphs [0129-0130]), and

performing channel estimation using the measured channel estimation errors and the set weights (blocks 124(1)-124(n) in figure 22; page 9, paragraph [0129]).

Abeta does not explicitly teach a system for receiving a first sub-carrier having a training symbol and a second sub-carrier having no training symbol. However an

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OFDM system for receiving a sub-carrier having a training symbol and another sub-carrier having no training symbol is well known in the art as it is evident by Matsuoka et al. (see page 2, paragraph [0017]; note: training symbol is known as preamble sequence, and no training symbol is known as data signal). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Matsuoka to the teaching of Abeta to provide a considerable simplification of the weight determining procedure as well as mitigating the effects of co-channel interference (page 3, paragraph [0022]).

(5) with regard to claim 17:

Abeta further discloses the channel estimator measures the channel estimation errors associated with the individual sub-carriers transmitted from at least two transmission antennas when the sub-carriers are received from the at least two transmission antennas(see figure 8, multiple antennas).

(6) with regard to claim 18:

Abeta further discloses the channel estimator measures the channel estimation errors irrespective of an influence of noise occurring in individual channels for transmitting the sub-carriers (page 8, paragraph [0130]; note that Abeta does not take into account noise in channel estimation process).

10. Claims 7 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Abeta et al. (US 2001/0028637) in view of Matsuoka et al. (US 2004/0008614) as applied to claim 7 above, and further in view of Scarpa (US 20040001563).

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Abeta and Matsuoka disclose all of the subject matters in claims 6 and 15 above but do not explicitly teach the first weight associated with the first sub-carrier is higher than the second weight associated with the second sub-carrier.

However, the weight associated with the sub-carrier having training symbol is higher than the weight associated with the sub-carrier having no training symbol is well known in the art as it is evident by Scarpa (see page 7, paragraph [0078]). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of Scarpa into the teaching of Abeta and Matsuoka in order to achieve more accurate carrier offset determinations in the relatively short amount of time (page 1, paragraph [0010]).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julia P. Tu whose telephone number is 571-270-1087. The examiner can normally be reached on 7:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh M. Fan can be reached on 571-272-3042. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

J.T.  
01/19/2007

  
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SUPERVISORY PATENT EXAMINER